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Honoring Dr. Herry O. Teltscher

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NEUROLEPTIC AGENTS AND HANDWRITING: A REVIEW OF THE PERIODICAL LITERATURE

Marcel Matley

ABSTRACT: This is a chronological survey of papers published in the medical periodical literature on neuroleptic agents and their effects on handwriting. Its purpose is to demonstrate scientific validation for some hypotheses in handwriting expertise identification from the literature of another discipline. Of central importance is the handwriting test developed by Hans J. Haase of Germany for determining optimal dosages of particular drugs. Lessons drawn from this medical literature, of value to the handwriting expert, include the need to draw some conclusions only from multiple handwriting samples, the need for a base sample which is proven to be the norm for measuring changes in other samples, and the need for a complex of graphic traits to support an inference or opinion. A glossary at the end provides definitions of key technical terms.

INTRODUCTION

The intent of this paper is not to supply authoritative medical information, but to provide a guide for study of the primary sources. Most of the enclosed research measures the effects of neuroleptic drugs by looking for changes in handwriting. The arrangement is chronological to show the historical development of the research. Concluding remarks apply this research to the needs of handwriting experts. A glossary is appended; refer to it as needed.

The following are provided as necessary background information:

(a) At low dosages, the neuroleptic agents are tranquilizers. At optimum dosages, they counter psychotic symptoms. At excessive dosages, they cause gross extrapyramidal symptoms.

(b) Response to neuroleptic agents is individual and apparently unrelated to any discernable factor, such as weight and age. The method for monitoring dosage must be individual, reliable, and cost effective.

(c) In current terminology, "antipsychotic agent" is used instead of "neuroleptic." Previously "psychotropic" was also a term used for neuroleptics.

ABSTRACTS OF PAPERS REVIEWED

Archives of Neurology and Psychiatry. 77:318-24, March 1957. "Comparison of psychological effects of certain centrally acting drugs in man." Conan Kornetsky et al.

Of four types of drugs when given singly, the neuroleptic reduced the speed of copying numbers the most. Reduction of writing speed is a major effect attributed to neuroleptics.

American Journal of Psychiatry. 115:577-85, Jan. 1959. "Therapeutic implications of differential effects of new phenothiazine compounds." Fritz A. Freyhan.

Though handwriting effects were considered, no specific data on handwriting effects is given.

American Medical Association. Journal. 171:1496-9, 1959. "Effect of chlorpromazine and alcohol on coordination and judgement." By George A. Zinkle et al.

Chlorpromazine was tested as a tranquilizer, both singly and in combination with alcohol. The two graphic skills tests were a) "that letters be written below numbers according to a jumbled key," and b) there be "crossing out of groups of four dots randomly printed in rows with dot groups of other denominations." Four combinations of chlorpromazine, alcohol and two placebos were administered. In the letter-digit test, the least impairment was with the placebo, the most with the combined drugs. In the dot checking test, the least impairment was with the placebo, and the worst with alcohol only.

Revue Canadienne de Biologie. 20:425-49, June 1961. "Extrapyramidal modification of fine movements; a 'conditio sine qua non' of the fundamental therapeutic action of neuroleptic drugs." Hans J. Haase.

Since handwriting is a combination of several fine movements: "Its investigation has two advantages . . . : a) The handwriting makes possible an exact comparison with the pattern of movements before, during, and after the treatment with neuroleptic drugs. b) The movements of the handwriting are much more differentiated than mass movements. . . ." This procedure is described later in this survey: see *Acta Psychiatrica Belgica.* 78:19-36, Jan.-Feb. 1978,

The patient must have a "normal" writing ability and the text written should be well known to the patient. Extrapyramidal handwriting manifestations, as known for decades in parkinsonism, are: 1. Stiffening of the writing; 2. Narrowing; 3. Letters becoming smaller; 4. Lessening of right slant and of horizontal lines to the right; and, 5. Tremor. All these relate to a slow tempo and severe left trend. The paper is richly illustrated with handwriting samples which are well explained. Eight tables provide the data discussed in the text. Three statements from the summary are:

"Neuroleptic drugs display their essential efficacy in psychiatry only if the fine movements (handwriting) show extrapyramidal manifestations of inhibition. . . .

"Absence of extrapyramidal manifestations in fine movements during treatment with neuroleptic drugs can be due only to unsuitable writing conditions or therapeutically inadequate dosage. . . .

"In a further comparative investigation we found that the handwriting is in all cases the first modality to show extrapyramidal manifestations during neuroleptic drug therapy. This applies especially if low dosages or the less potent neuroleptic drugs are used. . . ."

Comprehensive Psychiatry. 3: 227-34, 292-6, 1962. "Relevance of drug-induced extrapyramidal reactions to behavioral changes during neuroleptic treatment." G. G. Brune et al.

This was a study of 26 schizophrenic patients. Page 229: "Extrapyramidal symptoms were determined by clinical examinations and by evaluating the handwriting of patients as described by Haase. . . . On the average there was improvement during trifluoperazine medication in those patients in whom the drug did not induce any neurological reactions. Behavioral improvement however became more pronounced in those patients who exhibited marked changes in handwriting at a time when other extrapyramidal signs were not elicited by neurological examination." These handwriting signs were "abolished" with trihexyphenidryl, but behavioral improvements remained.

The handwritings before and after neuroleptic medication are shown. The authors say on page 230: "There is the typical reduction in the size of the letters, a narrowed letter formation and diminished facility. Slight or moderate muscular rigidity, cogwheel, tremor and reduction of associated movements during walking were observed in 13 patients. In most cases a combination of two or more of these symptoms were noted." The illustration shows that, compared to reduced height, letter width is relatively wider in some instances and no narrower in most. Similarly, word spacing in one of the two sets of writings is relatively wider with medication.

On page 232-233: "Our observations indicate that the optimal therapeutic effect was established only when very mild extrapyramidal symptoms occurred and especially when they were manifested in handwriting only. . . . [T]he above conclusions may not necessarily apply to the individual patient though they represent a guide for neuroleptic treatment in general."

Journal of Nervous and Mental Diseases. 139:53, 1964. "Temporal changes in handwriting expansiveness in depressed and schizophrenic inpatients." J. Goodman et al.

It begins: "Analysis of handwriting has found increasing favor as a projective technique in psychiatric evaluation. Graphology was considered at first as a diagnostic aid, with a single specimen of script from a psychiatric patient studied as a static document. More recently, however, an attempt has been made to correlate changes observed in serial samples of handwriting with clinically observed changes in patients.

"Fluctuation in expansiveness (or overall size) appears to be the most readily observable change in the handwriting of psychiatric patients and seems to be a property with considerable clinical significance. It has been reported that 'graphic movements increase when a person loses control of himself'."

On page 54 the authors make a questionable conclusion from the proven factors which make for an expansion or contraction of the handwriting area: "Since no systematic changes of this sort nor persisting influences in social environment were expected to take place with a group of normal controls, no changes were anticipated in the expansiveness of their handwriting over time." The authors logically should have concluded the opposite, namely, that since loss of control tends to expand handwriting and increase of control tends to contract handwriting, a group of normals would have samples of handwriting over time which fluctuate in area as factors in their lives and environments influence the amount of control they exert over their expression and behavior.

They recorded horizontal and vertical expansion, number of lines used, time needed and pressure exerted. Data are reported for three groups: controls, depressives under medication, and schizophrenics under medication. The table shows that controls had less than 5% increase in overall area; depressives, almost 15 % increase; and schizophrenics, about a 15% decrease.

Arzneimittel Forschung/Drug Research. 16:180-5, Feb. 1966. "Psilocybin reactivity and time contraction as measured by psychomotor performance." Roland Fischer et al.

A hallucinogenic drug makes time appear to pass slowly, so that the handwriting rate is faster. Nearby space is perceived as enlarged, so that handwriting is enlarged, while distant space seems diminished. Contrariwise, a neuroleptic makes time appear to pass quickly, so that handwriting rate is slower. Nearby space seems diminished, and thus handwriting becomes smaller. Four sets of handwriting samples are given for subjects under psilocybin. Observations are hardly astute. The control sample was taken the day after the drug was administered, seemingly on the assumption that the sample would be equal to a drug-clean writing.

Nature. 209:433-4, Jan. 22, 1966. "Time contraction and psychomotor performance produced by psilocybin." R. Fischer et al.

Page 433: "We define time contraction in terms of an alteration in the signal per noise ratio of the sensor, or . . . an increase in data content. In short, if more events are happening within a chronological time unit, the phenomenon of time contraction is experienced. . . . . Within the framework of space-time equivalence, time contraction can be illustrated through the concomitant expansion of space; specifically, by the increased size of handwriting samples at the peak of the psychotomimetic drug experience."

Page 434: "We have refined the use of two already existing variables for the measurement of time contraction — handwriting samples and finger-tapping rates. . . . [T]he former proved useful for the characterization of 'strong reactors' and 'nonreactors,' the latter for that of 'reactors' and 'mild reactors.'"

Current Therapeutic Research. 9:51-9, Feb. 1967. "The schizophrenic's individual response to trifluoperazine." Walter Knopp et al.

After noting general agreement about the benefit of neuroleptics, their side-effects and average effective dose for each of them, the authors state: "Fourth, there is utter confusion in applying the knowledge gained from formal studies to the needs of the individual patient." Later: "The study reported here represents the attempt to find other *individual* predictors of response in addition to the *group* predictor of test sensitivity." (Emphases in original.) On page 53 they note "that all toxins and drugs acting upon the brain stem cause a 'triad' of symptoms in the following areas: the motor system, autonomic nervous system, and psychic system." They used a modified version of the Haase test.

American Journal of Psychiatry. 123:1490-8, JUNE 1967. "Drug-induced extrapyramidal symptoms and their relations to clinical efficacy." Ching-piao Chien and Alberto Dimascio.

This is a review of published research. On pages 1494-5 the authors discuss the work of Haase: "[Haase] then presented data showing a negative relationship between this 'coarse EPS' (clinical observation of marked EPS) and improvement ratings. It is peculiar that Haase did not present data on his 'fine handwriting measures' as related to therapeutic outcome." When Haase stated (see item 4 above) that the symptoms shown by the fine handwriting measure were a "conditio sine qua non" for positive therapeutic effects, he in essence gave a 1.0 correlation.

Pharmakopsychiatria. 1:54-62, 1968. "Explorations in the assessment and meaning of the subclinical extrapyramidal effect of neuroleptic drugs." W. Knopp.

On page 55 the author says: "Others who attempted to replicate H. J. Haase's work have become discouraged since Haase's method is based on subjective and impressionistic evaluation and thus is considered unreliable by these workers." If measuring a writing and stating its actual expanse in centimeters is subjective and impressionistic, then which measurement could ever be otherwise? Still, he goes on to explain how his method and findings correlated with Haase's.

The precise definition of handwriting area is given: "The planimeter is constructed in such a way that the paper can be inserted and fixed within the movable horizontal and vertical scales. The extension of the letters in either direction are considered to be the boundaries of the written samples. The area occupied by each verse [of the three written each session] was measured, the median selected and plotted day by day." Another person did a blind measurement of the same handwritings.

On page 59: "Possibly some of those who tried to replicate Haase's work were unduly impressed by fluctuations in the size of the handwriting and did not pay enough attention to other symptoms like stiffness, change in slant, tremor and others."

Diseases of the Nervous System. 29:515-24, August 1968. "A pilot investigation in neuroleptic therapy." Dankwart J. Mattke.

This is a detailed review of the Haase method. Terms are defined, the method described at length, and Mild, Moderate and Severe symptoms of extrapyramidal fine motor hypokinesis set forth. One figure gives handwriting samples illustrating the three classes of symptoms. Another shows six writings by one patient from the premedication baseline sample to the thirty-fifth day of treatment. Ten "general results" are explained, about which on page 521 the author states: "The fact that all our patients were sufficiently compensated and remained within the neuroleptic range, as shown by the handwriting, when a single maintenance dose was administered in the morning, indicates that the neuroleptic effect was prolonged over twenty-four hours." Effectiveness occurs between onset of fine extrapyramidal disturbances and coarse disturbances. On page 523: "The clinical usefulness of the handwriting test is demonstrated once more, with regard to the assessment of neuroleptic principles. . . . The degree of neuroleptic predisposition, once it has been established experimentally through fine motor studies in handwriting, can, therefore, be employed as a guide for drug treatment throughout the patient's illness."

Current Therapeutic Research. 10:520-8, Oct. 1968. "Further studies of the butyrophenone, CI-601 in chronic schizophrenic patients." J. G. Edwards et al.

In a study of 12 male schizophrenics, the authors collected handwriting samples weekly. They say no handwriting changes were observed where the neuroleptic threshold was crossed. They imply either that it was crossed only when the sample was taken, or that a sample made one day reflected a threshold crossed on another. Whichever, the logic leaves something to be desired.

Japanese Journal of Pharmacology. 19:63-7, March 1969. "Effect of four centrally acting drugs on handwriting." B. N. Dhawan et al.

500 mg. of glucose was used as a placebo. Since the placebo altered the handwriting in some measurements as much as the drugs tested, the authors assumed that less alteration was caused by the four target drugs than the numbers indicated. They had a measure called "length of key words" and another "breadth of key words." No definitions are given. This is typical of the hazy nature of the work. They give speculative explanations for results and conclude that the handwriting test cannot differentiate various classes of agents. This concurs with the common opinion of document examiners.

Arzneimittel Forschung / Drug Research. 19:1941-5, Dec. 1969. "Unity and covariance of perception and behavior. Perceptual variability; a predictor of psychotomimetic drug-induced behavior." Roland Fischer et al.

Fifteen subjects were administered psilocybin and tested in several ways, including copying a passage on a special clipboard which measured pressure. Differences were found between the experimental and control group.

Current Therapeutic Research. 12:115-25, March 1970. "Parkinson's disease: L-dopa treatment and handwriting area." Walter Knopp et al. (Figure 1)

The authors begin: "For six years, our laboratory has used the measurement of handwriting area to monitor the action of neuroleptic drugs and other treatment modalities on psychiatric patients. It has become apparent that handwriting area could be useful in monitoring the effects of L-Dopa." Handwriting samples illustrate the opposite effects of L-Dopa and neuroleptics. The parkinsonian patient had micrographia before L-Dopa, but larger and faster writing after. For the excited psychotic patient treated with trifluoperazine, writing passed to much smaller and slower.

Page 120: "The form, size, and other aspects of handwriting result from 'a complete motor skill which requires fine spatial and temporal coordination. . .' It is a highly practiced skill, which is more resistant to the effect of drugs than unpracticed skill." That may explain why some studies found that some skill tests did not correlate with the results of handwriting tests.

On page 121: "Explanations were sought for the fact that three of the parkinsonian patients had pretreatment handwriting areas which were far above the range of the rest of the group. Patient F had a great deal of tremor and little rigidity before treatment. Patient L, who is a painter, moved her entire upper limb rather than just her hand as she wrote. Whenever she was encouraged to move her wrist only, the handwriting size decreased." Handwriting experts have long recognized that size depends principally on dominance of arm, hand or finger movement.

Acta Psychiatrica Scandinavica. Suppl. 212:11-9, 1970. "A rating scale for extrapyramidal side effects." G. M. Simpson and J. W. S. Angus.

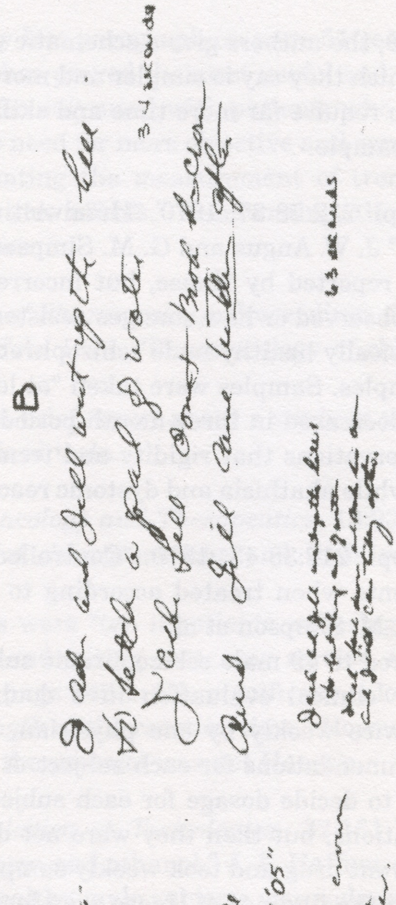

Figure 1: Actual handwriting samples before (upper samples) and after (lower samples) treatment. "A" is a parkinsonian patient treated with L-Dopa. "B" is an excited psychotic patient treated with trifluoperazine. The length of time required to write a verse is indicated to the right of each sample.

In an appendix on pages 17-19, the authors give a schematic view of observations on which their scale is based, which they say is simpler and more easily learned than Haase's. But they would seem to require far more time and skill than the making and measuring of a handwriting sample.

Acta Psychiatrica Scandinavica. Suppl. 212:28-37, 1970. "Handwriting changes and response to drugs; a controlled study." J. W. Angus and G. M. Simpson.

The authors confirm results reported by Haase, but incorrectly claim that Haase did not state precise features observed or how changes assisted in dosages.

The subjects were thirty physically healthy male schizophrenics, eighteen of whom could provide handwriting samples. Samples were taken "at least three times a week." Dosages were increased or decreased in three-month periods. On pages 32-33: "This corresponds to Haase's observations that rigidity and tremor were closely related to the neuroleptic threshold, while akathisia and dystonic reactions were not."

Acta Psychiatrica Scandinavica. Suppl. 212:38-43, 1970. "Controlled comparison of the treatment of schizophrenic patients when treated according to the neuroleptic threshold or by clinical judgment." G. M. Simpson et al.

Fluphenazine was administered to 19 male schizophrenic subjects who were evaluated either by handwriting or clinical evaluation in a double blind study. Handwriting samples were taken twice weekly by one physician, while a second physician made clinical dosage recommendations for each subject. A third physician alone knew which method was used to decide dosage for each subject. Results supported Haase's findings with reservations, but then they were not doing the Haase test correctly. Later they used a different drug and took weekly samples of handwriting. Unsurprisingly, results confirmed the findings of Haase even less.

Acta Psychiatrica Scandinavica. Suppl. 212:44-51, 1970. "Controlled studies of anti-Parkinson agents in the treatment of drug-induced extrapyramidal symptoms." G. M. Simpson.

Out of a battery of tests, one was modeled on Haase's and used to track extrapyramidal symptoms and their relief. A placebo or the anti-Parkinson agent was given. Handwriting showed significant changes over baseline with the anti-parkinsonian agent, but none with the placebo. The baseline sample was that exhibiting the extrapyramidal symptoms. On page 49 he discusses the comparative value of the tests employed: "Provided the patient will write at all, the changes in handwriting are least influenced by psychological factors." And on page 50: "The handwriting was the only measure which demonstrated significant differences between the placebo and the active drug in both the intravenous and oral studies."

The very last paragraph on page 51 reads: "The use of handwriting as a rating instrument has proved the most useful and effective in our experience, but unfortunately it can be only used with patients who are able to write and who co-operate in doing so. The need for more objective and sensitive measures is obvious and we are currently evaluating the measurement of tremor as a parameter of drug-induced extrapyramidal side effects." Handwriting, though, can show delicate tremor and a variety of tremors.

British Journal of Pharmacology. Proceedings of the British Pharmacological Society. 41:431P-432P, Feb. 1971. "Pharmacology of chlorpromazine; clinical studies." S. H. Curray et al.

This is a brief report about a study in which handwriting is employed as one of several standard tests.

Clinical Pharmacology and Therapeutics. 13:931-46, Nov. 12, 1972. "Physiologic and clinical effects of chlorpromazine and their relationship to plasma level." George Sakalis et al.

Subjects were "ten inpatients suffering from functional psychoses." Testing, including the handwriting test, was carried out pretreatment and mostly weekly afterwards. On page 940-1: "No significant chlorpromazine effects were found on the handwriting length or the reaction time." However, patients were allowed a nighttime sedative, while the protocol was not Haase's.

Acta Pharmacologica et Toxicologica. 32:161-78, 1973. "Mental and psychomotor effects of diazepam and ethanol." J. F. Haffner et al.

Eight healthy male subjects were administered ethanol, diazepam or a placebo. Of eight tests given, two were of graphic skills. On pages 175-6 the authors summarize their results: "Another difference [between alcohol and diazepam] in behavior is the attitude towards the trials in the Letter-Cancellation and the Mirror Tracing Test. Under the influence of alcohol, subjects made more attempts and more errors; subjects who had taken diazepam worked more slowly, attempted less, but did not make more mistakes than in the placebo experiments. . . ."

Journal of Clinical Pharmacology. 13:408-15, Oct. 1973. "Controlled comparison of metiapine and chlorpromazine in chronic schizophrenia." George M. Simpson et al.

This reports a treatment using the handwriting test as a reliable measurement.

Archives of Neurology. 29:444-6, Dec. 1973. "Physostigmine effects of phenothiazine-induced extrapyramidal reactions." By Lalit M. Ambani et al.

One handwriting illustration on page 445 shows the effects which the drugs had on the handwriting. It also shows poor ability to observe. In the top of two rows, the patient drew a spiral, a triangle and wrote "New Haven," all in a descending column. Physostigmine was injected, and the same writing was made across the top row at 3, 14 and 35 minutes. The authors state that the drug "had no effect on the patient's handwriting before therapy." On the contrary, the number of turns in the spiral are reduced, the writings become closer, darker, less simplified and narrower.

The second row of the figure shows writings before administration of fluoperazine followed by physostigmine, and then at 4, 13 and 40 minutes after the combined drugs. They say that at 40 minutes the writing returns to preinjection status. On the contrary, the last writing is the most crowded, while the 4 and 13 minute samples are obviously characterized, as the authors say, by rigidity and tremor. At 13 minutes about half of the intended forms are incorrect.

Journal of Internal Medicine Research. 5:321-30, 1974. "The clinical importance of the neuroleptic threshold." H. J. Haase et al.

This cumulates results reported in several papers and provides the background information needed to understand the problem, the method itself and the results attained since the connection between neuroleptic effect and handwriting changes was first established in 1953/54. The authors are impressive in their thoroughness, clear explanations and intelligent reasoning.

Current Therapeutic Research. 16:477-82, May 1974. "Early clinical trial of lenperone (AHR 2277), a butyprophenone, in chronic schizophrenia." George M. Simpson and Vera Varga.

This was not a study of the Haase handwriting test, but an application of it as a standard, reliable protocol.

Clinical Pharmacology and Therapeutics. 15:631-41, June 1974. "Bioequivalency of generic and brand-name chlorpromazine." George M. Simpson et al.

This was not a testing of the Haase handwriting test, but it's use as a standard, reliable measure.

Texas Reports on Biology and Medicine. 33:371-90, 1975. "Drug-induced handwriting changes: an empirical review." Leon J. Gross.

This is a survey of about 30 published research papers. The introduction states: "There are several advantages in utilizing handwriting [to test effects of drugs]. First, the analytic sample is easily obtained and provides a permanent record. Second, since handwriting is one of the most complex, coordinated human activities, intrusions upon the nervous system should logically produce alterations in one's usual writing pattern. Finally, since it is such a well-established act, handwriting should provide a conservative measure of the actions of pharmacological agents."

On page 377 he considers Haase's work: "Perhaps the most sophisticated, significant, and replicated research in the area of drug-induced handwriting changes was pioneered by Haase (1961) in his work on the relationship between the therapeutic response to a neuroleptic agent and the handwriting changes which are produced." The reference, Haase (1961), is item 4 above.

Biological Psychiatry. 10:65-8, Feb. 1975. "Neuroleptic-induced Kluver-Bucy syndrome." E. Varga et al.

Two cases are reported of patients who said they did not recall their behavior under the Kluver-Bucy syndrome, which was terminated by an anti-Parkinson agent. The handwriting for one patient is shown. During the episode, it is like random notations as to topic and placement. Four days afterwards, it is easily legible and a properly placed copy of the printed text.

Communications in Psychopharmacology. 1:157-66, 1977. "Relationships among clinical response, extrapyramidal syndrome and plasma chlorpromazine and metabolite ratios." G. Sakalis et al.

The authors reported that only 9 out of 50 patients developed micrographia. Since the manner of administering the Haase test is not described nor any samples reproduced, they may have done what some other researchers may have done: not follow the protocol correctly or misobserve.

Acta Psychiatrica Belgica. 78:19-36, Jan.-Feb. 1978. "Purely neuroleptic effects and its relation to the 'neuroleptic threshold'". H. J. Haase.

This summarizes the results from "more than 50,000 investigations with 30 different short-term and long-term neuroleptics [which] have been carried out on approximately 850 schizophrenics whose extrapyramidal fine movements were tested according to the author's handwriting-test." Formerly walking gait was observed to determine extrapyramidal effects; by then there was probably an over-dose. Handwriting was more reliable and precise as a measure. In summary, the procedure is: 1. Take writing samples each day under exact same conditions with same text and materials; samples should be completed without interruption; 2. Take samples two or three days prior to medication; 3. Gradually increase dosage till the individual's writing sample indicates the neuroleptic threshold for that individual had been reached; 4. Monitor medication with handwriting samples till beneficial effects are achieved.

For 5% of the subjects, the hospital environment gave relief of positive psychotic symptoms. 2% found relief below the medication threshold. 68% had relief within 12 days and above the threshold. 14% had relief by the 20th day. Eleven sets of samples are reproduced, each showing smaller writing under medication. From the reproductions, other changes in writing seem also to be the same, such as reduced variation and less perseveration. At least some of the before-medication samples also appear to have stronger final emphasis of some type.

Acta Psychiatrica Belgica. 78:83-8, Jan.-Feb. 1978. “Neuroleptic potency of bromperidol.” H. J. Haase et al.

This reports an application of the Haase method to test one agent.

Archives of General Psychiatry. 35:483-9, April 1978. “Are prophylactic antiparkinson drugs necessary? A controlled study of procyclidine withdrawal.” Arthur Rifkin et al.

On page 485: “At each examination . . . the time it took to copy a paragraph, and the area used for the paragraph were obtained.” On page 488, referring to the five groups of patients with varying reactions to the drug, the authors state: “Though patients in whom akinesia developed with or without EPS took longer to copy the paragraph, there were no significant differences. . . .” They do not say what they considered a significant difference.

American Journal of Psychiatry. 136:839-40, June 1979. “Micrographia and akinesia.” Daniel R. Shackman.

This was a study to determine the reliability of the Haase handwriting test. After saying that subjects had a 1-21 day drug-free period and that handwriting samples were taken at 9:00 a.m. before the first treatment and weekly thereafter, the author said the procedure followed the technique used by Haase and Jensen. However, compare with the description of the Haase method given in previous entry for *Acta Psychiatrica Belgica,* 78: 19-36, Jan.-Feb. 1978. “Purely neuroleptic effects and its relation to the ‘neuroleptic threshold” by H.J. Haase. Shackman concluded that micrographia was not a reliable indicator of akinesia because, whereas those patients who developed akinesia had restricted handwriting to a statistically significant degree, “10 of 11 non-akinetic patients’ handwriting constricted at some time during the course of drug treatment. Further, a group of control subjects demonstrated the same degree of handwriting constriction at some point during an equivalent period of study.”

Arzneimittel Forschung/Drug Research. 29:1056-62, 1979. “Pipotiazine pharmacokinetics after p.o. and i.v. administration in man. Correlation between blood levels and effect on the handwriting area.” By P. J. De Schepper et al.

Subjects were hospitalized chronic schizophrenic males. There was a 6 to 8 week wash-out period. Handwriting samples were properly controlled as to circumstances of the writing. The value of the test is limited by what the authors say on page 1058: “As only three patients were involved in the measurement of handwriting areas and each of them was treated with different doses of Pipotiazine, no further statistical evaluations were performed on the differences in handwriting area observed. . . .”

There was a reduction in handwriting area for each patient on the day the drug was administered.

International Journal of Clinical Pharmacology, Therapy and Toxicology. 23:S34-S41, April 23, 1985, Supple. "The handwriting test as an aid to neuroleptic dosage." U. Kastner and B. Muller-Oerlinghausen.

This article is a survey of reports on the Haase test, which the authors describe. Rules to administer it are precise and standardized. Terminology is defined. On page S39 they conclude: "From the existing studies on the handwriting test, it seems that the closer the investigators kept to Haase's methodology, the more they were able to duplicate his results. There still remains considerable doubt as to whether his hypotheses really hold true for all patients as he claims. But we feel that further research is certainly warranted. Even if only 50% of schizophrenic patients would receive a more appropriate neuroleptic dosage through the use of this relatively simple and cheap method, this would be quite a step ahead towards improved safety in the treatment of psychotic disorders."

International Criminal Police Review. 408:9-20, Sept.-Oct. 1987.[1] "Handwriting and exogenous intoxication." By Alain Buquet and M. Rudler.

This is a marvelous article, well, richly and clearly illustrated. There is an excellent exposition of tremor. The authors define terms for observed, objective graphic traits. They do not contend that a diagnosis of toxin intake can be made from handwriting; rather, given the proven effects various toxins may have on the handwriting, the examiner can know when to consider the possibility. The authors delineate the symptomatic effects different toxins have on the writing. Neuroleptics are discussed on page 13: "These are far and away the main cause of tremors of toxic origin. . . . With large doses, the tremor which appears is reminiscent of that caused by Parkinson's disease (akinetic-hypertonic syndrome). This is accompanied by a reduction in motor activity hampering the slightest movements; in particular, handwriting becomes extremely small (about 12% smaller in size). . . ." The authors are medical and handwriting experts.

Canadian Society of Forensic Sciences Journal. 20:119-38, Dec. 1987.[2] "Effect of medication on handwriting." C. Gilmour and J. Bradford.

Hospitalized schizophrenic patients were studied. Three qualities were examined: 1. "Line quality — a measure of the smoothness and continuity of the stroke." 2. Size, including spacing between words and lines. 3. Individual characteristics, which the authors described by giving seven habits and ending with an ellipsis. Such amorphous methods of observation hardly inspire confidence. Within the narrow limits of what they knew to look for, it is a useful research project. On page 132 they say: "As reported, 80% or twelve out of fifteen of the subjects sampled, exhibited no appreciable change in their individual handwriting characteristics from Trial 1 to Trial 3, (see Figure 7 in the article).” However, in the samples of Figure 7 there are, among others changes, differences in depth of color, expansion and line spacing, all of which are significantly individual and identifying traits, while other figures show even more dramatic differences.

National Association of Document Examiners. Journal. 13:1-6, Feb. 1992. “Effects of drugs in handwriting.” Patricia Wellingham-Jones.

There is no specific information about neuroleptics, but I include it because the author provides the intelligent cautions handwriting experts need to keep in mind when faced with the problem of drugs and handwriting. She authored a book which every handwriting expert should obtain. The heart of the book is a 17-page table of drugs with their side effects on handwriting.[3]

CONCLUDING REMARKS

Cumulatively these papers can teach the handwriting expert important lessons, most of which touch on standard hypotheses within the discipline of handwriting identification, namely items (a), (d), (e) and (f).

(a) One needs to consider the circumstantial conditions of the writing, since so many studies showed that neuroleptics have effects on the handwriting.

(b) It seems that many studies showed a correlation between graphic variables and other behaviors under medication. We might consider replicating today the research into the parallels between handwriting and other expressive movements which Allport and others performed.[4]

(c) In many illustrations in these papers, graphic traits which are apparent to a skilled observer were missed by the authors. We need to be cautious regarding reported results of handwriting research where samples are not reproduced. It also indicates the desirability of having competent handwriting experts participate in handwriting research by other disciplines.

(d) In several papers the authors emphasize the need to consider what we would term a complex of parallel signs.

(e) Handwriting cannot indicate specific drugs or illnesses, since there are multiple causes for certain complexes of the same handwriting characteristics.

(f) Every study considered in this survey had the subject make several handwriting samples. At least one was a baseline sample against which changes could be measured. Without several samples of writing from the same subject, is it possible to ascertain how typical or atypical a particular sample is?

GLOSSARY

This is not to be taken as authoritative, only as a layperson's practical guide.

agent: an active force or substance which can produce a particular effect.

akathisia: an inability to sit still; a restless moving about.

akinesia: an inability to make voluntary movements.

anti-Parkinson agent: one that will relieve the symptoms which characterize Parkinsonism.

antipsychotic agent: one that will relieve the symptoms of a psychosis.

autonomic nervous system: that which governs the heart, glands and involuntary movements.

baseline: the condition a thing is in before an experiment begins.

blind study: one in which the person involved does not know some key factor.

centrally acting: an agent acting on the brain or spinal cord.

conditio sine qua non: Latin meaning a condition without which a thing will not occur.

control: what is unaffected by the experiment and so serves as a measure for changes.

controlled study: one in which factors which can influence the outcome are accounted for.

dystonic: characterized by abnormal tonicity impairing free movement in the muscles.

EPS: extrapyramidal symptoms.

extrapyramidal: having to do with the extrapyramidal motor system, which Stedman defines in part as "all of the brain structures affecting bodily movement, excluding the motor neurons, the motor cortex, and the pyramidal tract."

hypertonic: an excessive amount of tension.

hypokinesis: diminished or slow movement.

micrographia: unduly small handwriting.

modalities: the forms for medical therapy.

motor: that which causes movement; the neural system imparting impulses to muscles so that they contract.

neuroleptic: a family of drugs producing analgesia (relieving pain by altering the perception of the stimuli), sedation and tranquilization.

neuroleptic threshhold: the dosage at which the agent has its intended beneficial effects, indicated by the first appearance of parkinson-like symptoms in the fine motor movements of handwriting

perseveration in handwriting: compulsive repetition not needed for meaning or legibility.

placebo: an inert compound made to look like an agent being tested

protocol: the detailed plan of how a scientific study or procedure is to be performed.

psychoactive: having ability to alter some psychological function.

psychomotor: mental origin of physical movement; interrelation between mind and bodily function.

psychotic: one suffering from a psychosis, which Webster's Collegiate Dictionary defines as "fundamental mental derangement characterized by defective or lost contact with reality."

psychotomimetic: an agent producing changes similar to a psychosis.

psychotropic: a drug used to treat mental illness.

syndrome: a group of symptoms identified as indicating a particular condition.

wash-out period: time during which no medication is given so the subject is drug-free.

ENDNOTES:

1, 2. With permission of the copyright holder, the annotation for this item is taken from: Marcel B. Matley, *Health and Handwriting, an Annotated Bibliography of Forensic Periodical Leterature,* second ed. enl., San Francisco, Handwriting Services of California, 1994.

3. Jones, Patricia Wellingham, *Drugs and Handwriting,* Tehama, CA PWJ Publishing, 1991.

4. Allport, Gordon W. And Philip E., *Studies in Expressive Movement,* New York, Macmillan Co., 1933.

BIOGRAPHY: Marcel Matley studied handwriting analysis with Rose Toomey and was certified by the Paul de Ste. Colombe Center. In 1985 he became a full time professional document examiner and has other interests in medical and psychological research, paleography, education, Western formal penmanship and Oriental calligraphy. He is the author of several published monographs and articles, taught private classes and seminars, and presented at conferences. The American Handwriting Analysts Foundation's library, as well as a collection of more than 4,000 forensics and handwriting articles, is located in his home in San Francisco where it is available for reference by appointment.